

# The Fox and the Arrow: A Milky Way Star Tour

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# The Fox and the Arrow

Vulpecula and Sagitta might be small, unassuming constellations in the centre of the Summer Triangle, but their place along the path of the Milky Way makes them full of some interesting visual and astrophotographic delights. This region has lots of open clusters, emission and reflection nebulosity, planetary nebulae, and the occasional globular cluster as well.

This talk will take you on a star-hopping adventure starting at Albireo, the head of familiar Cygnus the Swan, and move through 16 targets of varying levels of difficulty that will please and challenge observers with many different levels of experience. Easy objects can be found in all sizes of telescopes. Moderate objects require at least 4 inches of aperture and some experience. Difficult objects require significant observing experience and at likely larger aperture.

# What is Star-Hopping?

A star hop is a telescopic journey through a small, selected part of the heavens. Use of detailed maps is recommended so that you can use small patterns and groupings of stars to 'hop' your way from target to target.

Star hopping allows you to take the scenic route, see the backroads of the heavens and get a real feeling for the part of the sky you are visiting.

Mapping out a good star-hop requires careful planning. Use of a detailed star atlas down to magnitude 9 such as Uranometria or Interstellarum or planetarium software such as Stellarium or Sky Safari to print your own detailed charts is highly recommended.







Start by looking for the Summer Triangle, made from the 3 bright stars Vega, Deneb and Altair. We will start near the centre of the triangle at 3rd magnitude Albireo, the head of Cygnus.



North

West

East

South

Albireo

Vulpecula

Sagitta

Our targets tonight are in Vulpecula and Sagitta, two small, relatively dim and unassuming constellations.



Albireo

Vulpecula

Sagitta

Okab

16

15

12

13

14

1

2

3

4

5

7

6

8

9

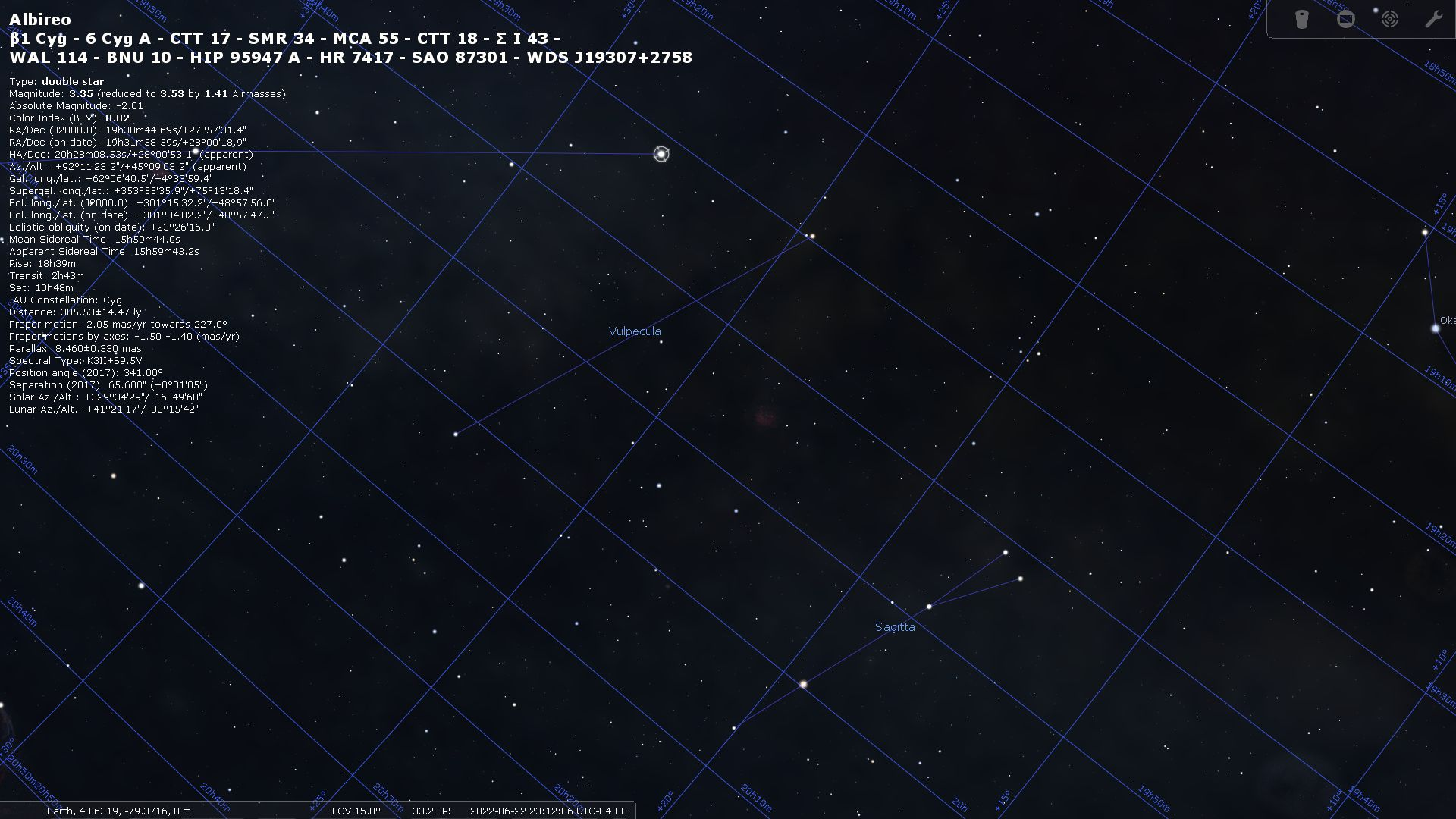
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11



**Albireo**  
 **$\beta$ 1 Cyg - 6 Cyg A - CTT 17 - SMR 34 - MCA 55 - CTT 18 -  $\Sigma$  I 43 -**  
**WAL 114 - BNU 10 - HIP 95947 A - HR 7417 - SAO 87301 - WDS J19307+2758**

Type: **double star**  
Magnitude: **3.35** (reduced to 3.53 by 1.41 Airmasses)  
Absolute Magnitude: **-2.01**  
Color Index (B-V): **0.82**  
RA/Dec (J2000.0): 19h30m44.69s/+27°57'31.4"  
RA/Dec (on date): 19h31m38.39s/+28°00'18.9"  
HA/Dec: 20h28m08.53s/+28°00'53.1" (apparent)  
Az./Alt.: +92°11'23.2"/+45°09'03.2" (apparent)  
Gal. long./lat.: +62°06'40.5"/+4°33'59.4"  
Supergal. long./lat.: +353°55'35.9"/+75°13'18.4"  
Ecl. long./lat. (J2000.0): +301°15'32.2"/+48°57'56.0"  
Ecl. long./lat. (on date): +301°34'02.2"/+48°57'47.5"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 18h39m  
Transit: 2h43m  
Set: 10h48m  
IAU Constellation: **Cyg**  
Distance: 385.53±14.47 ly  
Proper motion: 2.05 mas/yr towards 227.0°  
Proper motions by axes: -1.50 -1.40 (mas/yr)  
Parallax: 8.460±0.330 mas  
Spectral Type: **K3II+89.5V**  
Position angle (2017): 341.00°  
Separation (2017): 65.600" (+0°01'05")  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"





# 1 - Albireo - Beta Cygni

Type: Double Star

Magnitude: 3.1 and 5.1

Distance: 420-480ly

Separation: 34"

Difficulty - Very Easy

Our journey begins with the beautiful colour contrast between this pair of topaz and sapphire gems. Remarkable in any sized telescope!

These stars are actually 60ly apart and are not a true physical system, but their proximity along our line of sight makes them a visual delight regardless!



# WS 9003 - $\Sigma$ 2525 - HIP 95589 A - HD 183032 - SAO 87213 - WDS J19266+2719

Type: **double star**  
Magnitude: **8.05** (reduced to **8.23** by 1.40 Airmasses)  
Absolute Magnitude: 3.77  
Color Index (B-V): **0.48**  
RA/Dec (J2000.0): 19h26m35.34s/+27°19'20.6"  
RA/Dec (on date): 19h27m29.33s/+27°22'00.6"  
HA/Dec: 20h32m17.50s/+27°22'34.9" (apparent)  
Az./Alt.: +93°41'09.6"/+45°31'55.2" (apparent)  
Gal. long./lat.: +61°06'43.5"/+5°04'37.6"  
Supergal. long./lat.: +355°31'00.7"/+76°16'12.2"  
Ecl. long./lat. (J2000.0): +299°40'46.6"/+48°33'19.7"  
Ecl. long./lat. (on date): +299°59'17.0"/+48°33'11.1"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 18h38m  
Transit: 2h39m  
Set: 10h40m  
IAU Constellation: Vul  
Distance: 233.64±19.48 ly  
Proper motion: 131.16 mas/yr towards 47.6°  
Proper motions by axes: 96.90 88.40 (mas/yr)  
Parallax: 13.960±1.270 mas  
Spectral Type: F9V  
Position angle (2020): 290.00°  
Separation (2020): 2.300"  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"

Vulpecula

Sagitta

From Albireo, hop 1.2 degrees southwest to double star Struve 2525

## 2 - Struve 2525

Type: Double Star

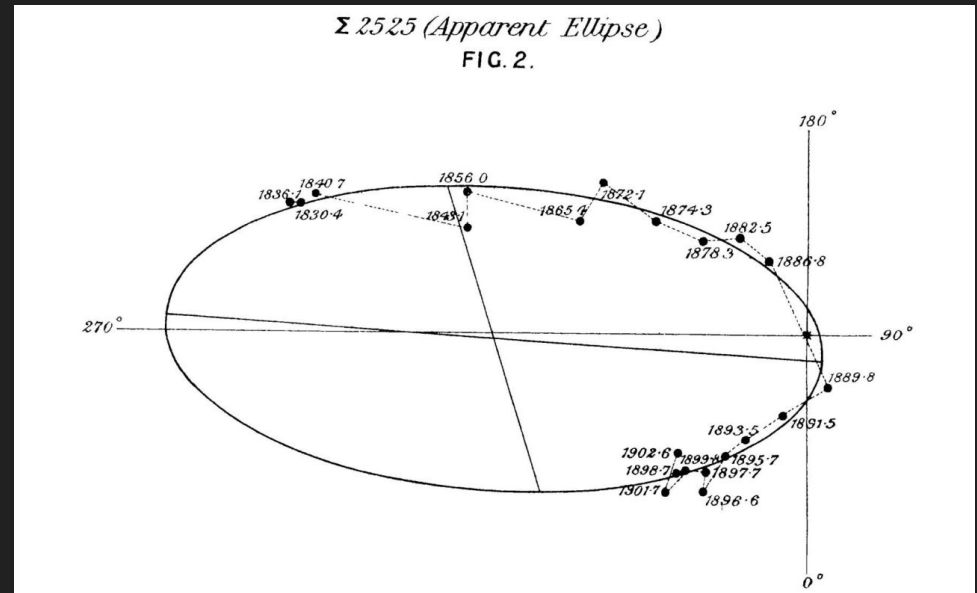
Magnitude: 8.1 and 8.4

Distance: 200ly

Separation: 2"

Difficulty - Moderate-Difficult

This double star can be a bit of a challenge to resolve due to the faintness of its members. This pair of sun-like stars orbit one another every 1,000 years with an average distance of about 120AU - about 3 times the distance Pluto is from the Sun!





# ES 483 - Z Vul - HIP 95163 - HD 181987 - SAO 87113 - WDS J19217+2534

Type: **eclipsing binary system, double star** (EA/SD)  
Magnitude: **7.25** (reduced to 7.43 by 1.40 Airmasses)  
Absolute Magnitude: -1.46  
Color Index (B-V): **0.07**  
Magnitude range: **7.25+8.90/7.58** (Photometric system: V)  
RA/Dec (J2000.0): 19h21m40.51s/+25°34'26.7"  
RA/Dec (on date): 19h22m85.44s/+25°36'57.8"  
HA/Dec: 20h37m11.28s/+25°37'33.6" (apparent)  
Az./Alt.: +96°37'17.3"/+45°22'37.3" (apparent)  
Gal. long./lat.: +59°02'39.2"/+5°14'00.6"  
Supergal. long./lat.: +355°16'04.6"/+78°20'05.3"  
Ecl. long./lat. (J2000.0): +297°31'30.5"/+47°04'51.9"  
Ecl. long./lat. (on date): +297°50'01.6"/+47°04'43.0"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 18h43m  
Transit: 2h34m  
Set: 10h26m  
1AU Constellation: Vul  
Distance: 1801.97+33.80 ly  
Proper motion: 4.54-mas/yr towards 262.4°  
Proper motions by axes: -4.50 -0.60 (mas/yr)  
Parallax: 1.810±0.035 mas  
Spectral Type: B3/5+A3IV?  
Period: 2.45493 days  
Next minimum light: 2022-06-23 10:56:26 UTC  
Duration of eclipse: 18% (0d 10h 36m 19.1348s)  
Position angle (2015): 3.00°  
Separation (2015): 13.800"  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



Hop 1.33 degrees further southwest to 5th mag 3 Vulpeculae then further on 0.75 degree south-southwest to a pair of 7th magnitude stars. Normally similarly bright, but the southeastern one is variable star Z Vulpeculae.

# 3 - Z Vulpeculae

Type: Eclipsing Variable Star

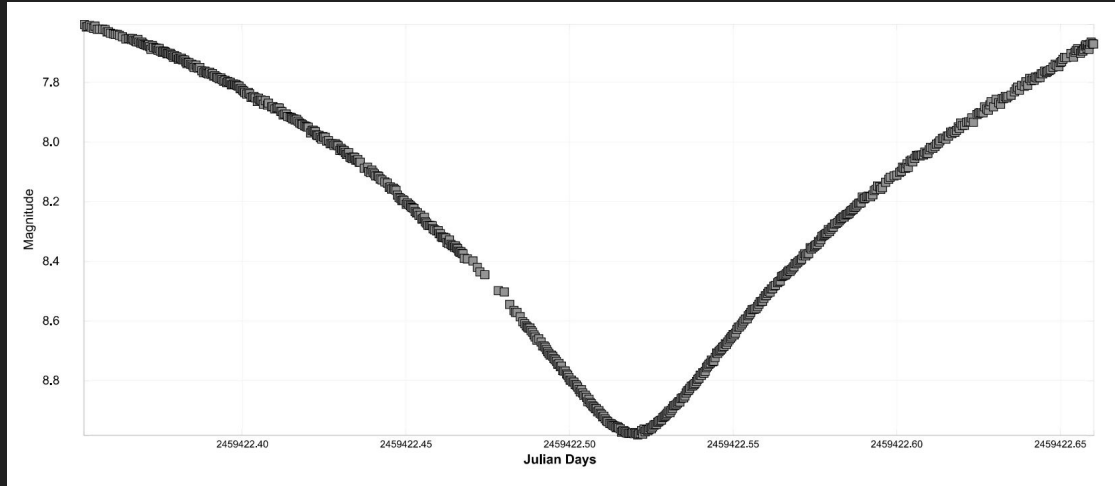
Magnitude: 7.3-9.3

Distance: 626ly

Period: 2.45 days

Difficulty - Moderate

This eclipsing variable is normally 7th magnitude, similar in brightness to another nearby 7th magnitude star. However, for about 10 hours every 2.45 days, the star fades to 9th magnitude! Compare it to the nearby 7th magnitude star and see if it is eclipsing while you are observing!



# NGC 6800

Type: **open star cluster** (III2p)  
RA/Dec: (J2000.0): 19h27m06.19s/+25°07'45.1"  
RA/Dec: (on date): 19h28m01.51s/+25°10'26.1"  
HA/Dec: 20h31m45.34s/+25°11'03.6" (apparent)  
Az./Alt.: +96°04'18.9"/+44°07'58.8" (apparent)  
Gal. long./lat.: +59°13'33.0"/+3°56'32.6"  
Supergal. long./lat.: +349°11'17.9"/+77°57'20.6"  
Ecl. long./lat. (J2000.0): +299°08'21.9"/+46°23'33.4"  
Ecl. long./lat. (on date): +299°26'52.9"/+46°23'14.6"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 18h51m  
Transit: 2h40m  
Set: 10h29m  
Parallactic Angle: -52°41'10.6"  
IAU Constellation: **Vul**  
Morphological description: no noticeable concentration of stars,  
medium brightness range of cluster members,  
poor cluster with less than 50 stars.  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



Move 1.33 degrees east-southeast to our first deep sky object of the night, open cluster NGC6800.



## 4 - NGC6800

Type: Open Cluster

Distance: 3300ly

Diameter: 30' or less

Difficulty - Difficult

About half a degree northwest of Alpha and 8 Vulpeculae, this sparse open cluster has about 25-50 stars with no visible central concentration. The stars range from 10th magnitude to fainter. It stands out from the general star field, but is a little challenging.



# vdB 126 - LBN 134 - Ced 167

Type: reflection nebula (I, BR)  
Magnitude: 8.30 (reduced to 8.49 by 1.47 Airmasses)  
Surface brightness: 11.49 mag/arc-min<sup>2</sup> (after extinction: 11.68 mag/arc-min<sup>2</sup>)  
Contrast index: 0.65  
RA/Dec (J2000.0): 19h26m06.17s/+22°44'57.4"  
RA/Dec (on date): 19h27m02.84s/+22°47'36.6"  
HA/Dec: 20h32m44.02s/+22°48'17.4" (apparent)  
Az./Alt.: +98°50'20.7"/+42°50'0.2" (apparent)  
Gal. long./lat.: +57°00'59.6"/+3°01'06.9"  
Supergal. long./lat.: +341°29'11.0"/+79°50'08.8"  
Ecl. long./lat. (J2000.0): +298°07'00.1"/+44°06'35.6"  
Ecl. long./lat. (on date): +298°25'31.7"/+44°06'26.7"  
Elliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h02m  
Transit: 2h39m  
Set: 10h16m  
Parallactic Angle: -50°52'52.2"  
IAU Constellation: Vul  
Size: +0°08'00.00" x +0°03'00.00"  
Distance: 0.300 kpc (978.6 ly)  
Parallax: 3.000 mas  
Morphological description: bright, the illuminating star is embedded in the nebulosity.  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



Shift southeast to centre on Alpha and 8 Vulpeculae, a pair of reddish orange stars. Swing 2 degrees due south to a pair of 7th magnitude stars lined up east to west. Our next target is just to their west.

# 5 - van den Bergh 126

Type: Reflection Nebula

Distance: 2720ly

Difficulty - Very Difficult

This one is a real challenge! A small reflection nebula lit by an 8th magnitude star, HD 182918. It is superimposed over the background of the dark nebulae LDN 768 and 769. Minimum aperture of 8 inches under dark, transparent skies is needed!





# Coathanger (Al Sufi's Cluster - Brocchi's Cluster - Al-Sufi's Nebula - The Snail)

IC 399

Type: **star cluster** (III2p)  
Magnitude: **3.60** (reduced to **3.80** by **1.52** Airmasses)  
Surface brightness: **12.23** mag/arc-min<sup>2</sup> (after extinction: **12.43** mag/arc-min<sup>2</sup>)  
Contrast index: 0.35  
RA/Dec (J2000.0): 19h25m25.35s/+20°10'57.7"  
RA/Dec (on date): 19h26m25.46s/+20°13'55.7"  
HA/Dec: 20h33m23.45s/+20°14'20.4" (apparent)  
Az./Alt.: +101°37'06.8"/+41°18'10.4" (apparent)  
Gal. long./lat.: +54°40'43.0"/+1°56'35.0"  
Supergal. long./lat.: +229°19'19.6"/+81°29'55.9"  
Ecl. long./lat. (J2000.0): +297°12'35.5"/+41°37'32.7"  
Ecl. long./lat. (on date): +297°31'07.7"/+41°37'23.8"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h14m  
Transit: 2h38m  
Set: 10h03m  
Parallactic Angle: -49°04'43.5"  
GAU Constellation: Vul  
Size: +1°00'00.00"  
Morphological description: no noticeable concentration of stars, medium brightness range of cluster members, poor cluster with less than 50 stars.  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



Due south from Van Den Bergh 126 is The Coathanger Cluster a further 2 degrees or so.

## 6 - The Coathanger - Brocchi's Cluster

Type: Asterism

Distance: 237-1200ly

Difficulty - Very Easy



Stars ranging from 5th-7th magnitude forming a remarkable asterism visible in binoculars or in a telescope under widefield low power. It can be seen with the naked eye as a fuzzy brightening of the Milky Way under dark skies. Very striking! Although this was considered to be a true cluster for a long time, it's members vary wildly in distance and proper motion.

# NGC 6802 - Cr 400

Type: **open star cluster** (M11m)  
Magnitude: **8.80** (reduced to **9.00** by **1.54** Airmasses)  
Color Index (B-V): **1.27**  
Surface brightness: **11.16** mag/arc-min<sup>2</sup> (after extinction: **11.36** mag/arc-min<sup>2</sup>)  
Contrast index: 0.78  
RA/Dec (J2000.0): 19h30m37.34s/+20°15'31.4"  
RA/Dec (on date): 19h31m35.48s/+20°18'18.8"  
HA/Dec: 20h28m11.54s/+20°19'04.6" (apparent)  
Az./Alt.: +100°29'12.1"/+40°25'52.5" (apparent)  
Gal. long./lat.: +55°19'38.7"/+0°54'25.7"  
SDRgal. long./lat.: +326°01'35.6"/+80°23'30.0"  
Ecl. long./lat. (J2000.0): +298°49'38.1"/+41°27'26.5"  
Ecl. long./lat. (on date): +299°08'10.1"/+41°27'37.7"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h18m  
Transit: 2h43m  
Set: 10h08m  
Parallactic Angle: -49°22'08.1"  
IAU Constellation: Vul  
Size: +0°03'20.40"  
Redshift: 0.000041±0.000009  
Morphological description: no noticeable concentration of stars,  
small brightness range of cluster members,  
moderately rich cluster, with 50-100 stars.  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



Our next object is NGC6802, a dim small cluster just off the east end of the Coathanger.



# 7 - NGC6802

Type: Open Cluster

Magnitude: 8.8

Diameter: 5'

Distance: 3600ly

Difficulty: Moderate-Difficult

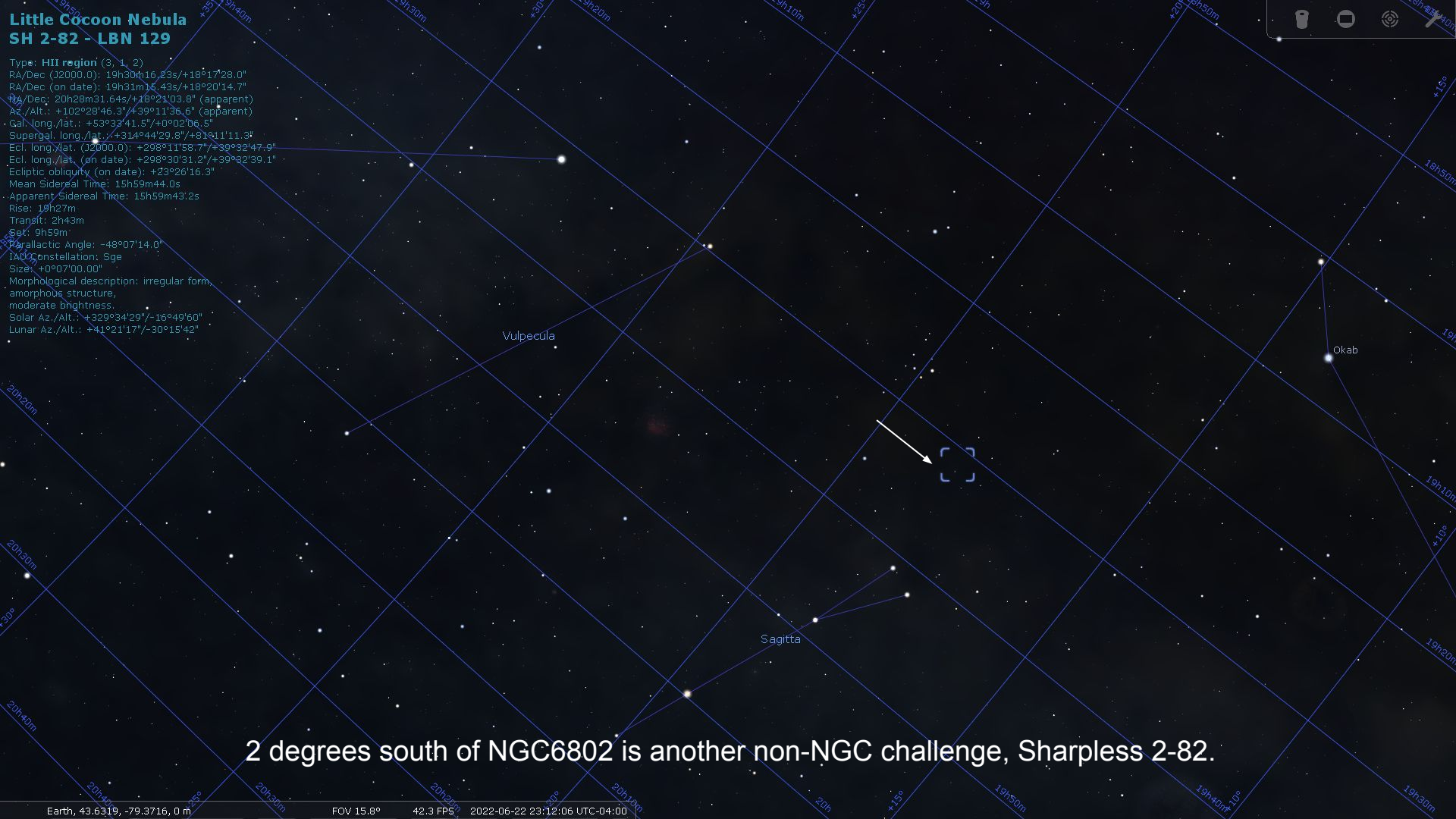


Often neglected, this compressed cluster of stars ranges from 14h-18th magnitude just off of the eastern end of the Coathanger. It is extended north-south, with some people seeing it as a rectangular shape. In small scopes, it just appears as a fuzzy glow.



# Little Cocoon Nebula SH 2-82 - LBN 129

Type: HII region (3, 1, 2)  
RA/Dec (J2000.0): 19h30m16.23s/+18°17'28.0"  
RA/Dec (on date): 19h31m15.43s/+18°20'14.7"  
RA/Dec: 20h28m31.54s/+18°21'03.8" (apparent)  
Az./Alt.: +102°28'46.3"/+39°11'36.6" (apparent)  
Gal. long./lat.: +53°33'41.5"/+0°02'06.5"  
Supergal. long./lat.: +314°44'29.8"/+81°11'11.3"  
Ecl. long./lat. (J2000.0): +298°11'58.7"/+39°32'47.9"  
Ecl. long./lat. (on date): +298°30'31.2"/+39°32'39.1"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h27m  
Transit: 2h43m  
Set: 9h59m  
Parallax: Angle: -48°07'14.0"  
IAU constellation: Sge  
Size: +0°07'00.00"  
Morphological description: irregular form,  
amorphous structure,  
moderate brightness.  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



2 degrees south of NGC6802 is another non-NGC challenge, Sharpless 2-82.

# 8 - Sh2-82 - The Little Cocoon Nebula

Type: Emission and Reflection Nebula

Magnitude: 8.8 (?)

Diameter: 7'

Distance: 3590ly

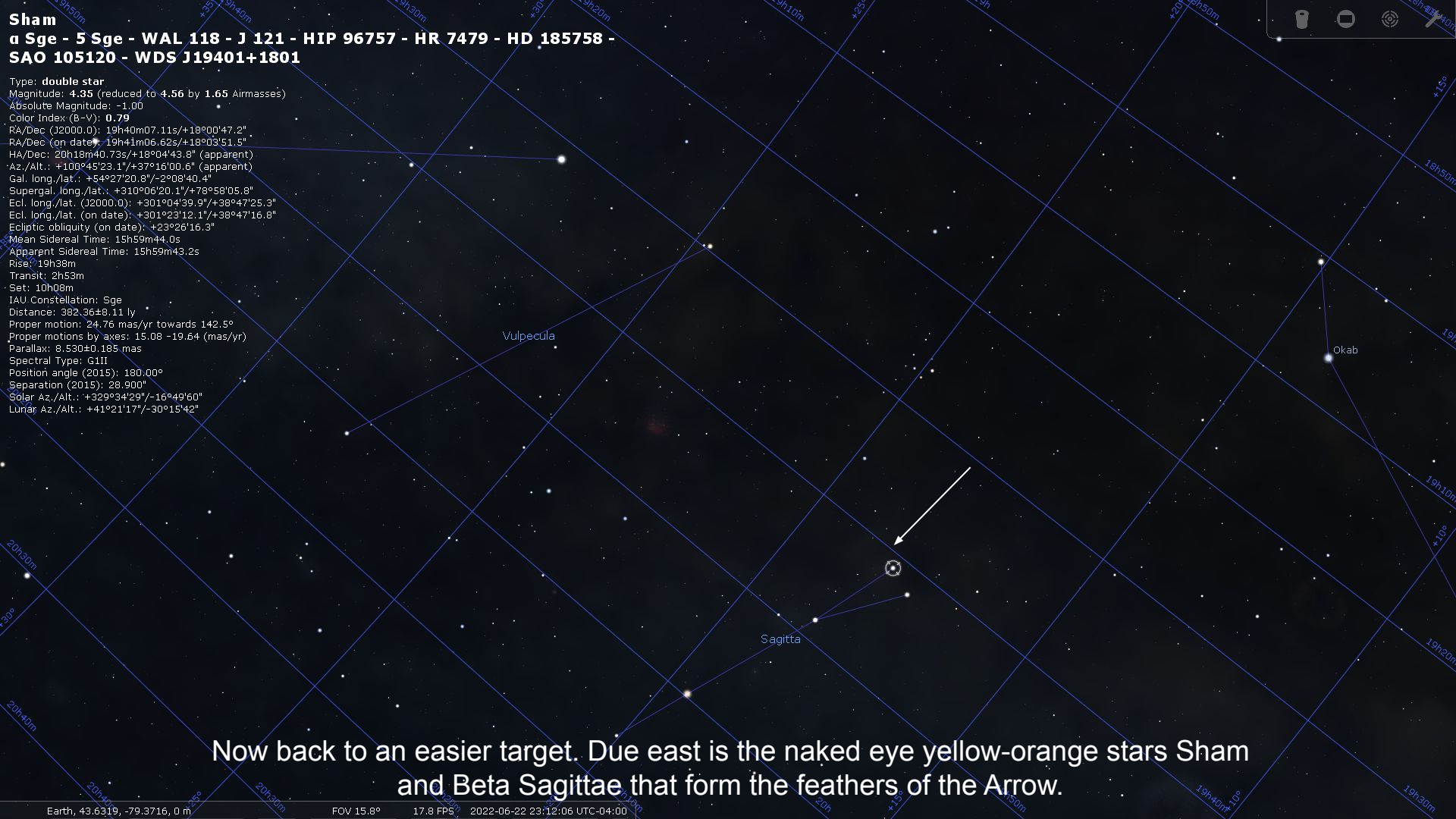
Difficulty - Very Difficult

Lit by an 11th magnitude star, this nebula is irregularly round. It was termed moderately bright in Lynd's catalog. It is involved with LDN727. Using at least 6 inches of aperture under dark skies, look for a faint irregular glow around the 11th magnitude star next to the brighter nearby uninvolved 7th magnitude star.



**Sham**  
**α Sge - 5 Sge - WAL 118 - J 121 - HIP 96757 - HR 7479 - HD 185758 -**  
**SAO 105120 - WDS J19401+1801**

Type: **double star**  
Magnitude: **4.35** (reduced to **4.56** by **1.65** Airmasses)  
Absolute Magnitude: **-1.00**  
Color Index (B-V): **0.79**  
RA/Dec (J2000.0): **19h40m07.11s/+18°00'47.2"**  
RA/Dec (on date): **19h41m06.62s/+18°03'51.5"**  
HA/Dec: **20h18m40.73s/+18°04'43.8"** (apparent)  
Az./Alt.: **+100°45'23.1"/+37°16'00.6"** (apparent)  
Gal. long./lat.: **+54°27'20.8"/-2°08'40.4"**  
Supergal. long./lat.: **+310°06'20.1"/+79°58'05.8"**  
Ecl. long./lat. (J2000.0): **+301°04'39.9"/+38°47'25.3"**  
Ecl. long./lat. (on date): **+301°23'12.1"/+38°47'16.8"**  
Ecliptic obliquity (on date): **+23°26'16.3"**  
Mean Sidereal Time: **15h59m44.0s**  
Apparent Sidereal Time: **15h59m43.2s**  
Rise: **19h38m**  
Transit: **2h53m**  
Set: **10h08m**  
IAU Constellation: **Sge**  
Distance: **382.36±8.11 ly**  
Proper motion: **24.76 mas/yr** towards **142.5°**  
Proper motions by axes: **15.08 -19.64 (mas/yr)**  
Parallax: **8.530±0.185 mas**  
Spectral Type: **G1II**  
Position angle (2015): **130.00°**  
Separation (2015): **28.900"**  
Solar Az./Alt.: **+329°34'29"/-16°49'60"**  
Lunar Az./Alt.: **+41°21'17"/-30°15'42"**



Now back to an easier target. Due east is the naked eye yellow-orange stars Sham and Beta Sagittae that form the feathers of the Arrow.

## 9 - 'Sham' Alpha Sagittae and Beta Sagittae

Type: Stars

Magnitude: Both 4.38

Distance: 382ly and 420ly

Spectral Class: Sham - G1 II, Beta - G8 IIIa CN0.5

Difficulty - Very Easy



Back to an easier target! This pair of stars is naked eye in semi-dark skies. Because of their similar spectral types, they make a good test of your low-light colour discrimination. Using binoculars or a telescope, compare their colours. Beta should appear redder!



# Arrowhead Cluster (Arrowhead Cluster) M. 71 - NGC 6838 - Cr 409 - Mel 226

Type: **globular star cluster** (X-XI)  
Magnitude: **8.40** (reduced to **8.62** by **1.73** Airmasses)  
Color Index (B-V): **-0.49**  
Surface brightness: **11.93** mag/arc-min<sup>2</sup> (after extinction: **12.16** mag/arc-min<sup>2</sup>)  
Contrast index: 0.46  
RA/Dec (J2000.0): 19h53m47.75s/+18°46'42.3"  
RA/Dec (on date): 19h54m47.13s/+18°50'10.4"  
HA/Dec: 20h05m00.61s/+18°51'05.5" (apparent)  
Az./Alt.: +87°23'21.2"/+35°19'58.0" (apparent)  
Gal. long./lat.: +56°44'51.8"/-4°34'08.8"  
Supergal. long./lat.: +310°54'36.0"/+75°38'21.6"  
Ecl. long./lat. (J2000.0): +305°21'18.0"/+38°47'24.9"  
Ecl. long./lat. (on date): +305°39'49.7"/+38°47'16.9"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.8s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h48m  
Transit: 3h07m  
Set: 10h25m  
Parallactic Angle: -49°19'43.5"  
IAU Constellation: Sge  
Size: +0°07'12.00"  
Distance: 4.000 kpc (13048.0 ly)  
Redshift: -0.000056±0.000031  
Morphological description: loose concentration of stars.  
Solar Az./Alt.: +329°34'29"/+16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



From Sham, move 3 degrees east-northeast along the Arrow's shaft towards the 8th magnitude glow of M71

# 10 - M71 - Angelfish Cluster

Type: globular cluster

Magnitude: 8.2

Distance: 12,000ly

Diameter: 7'

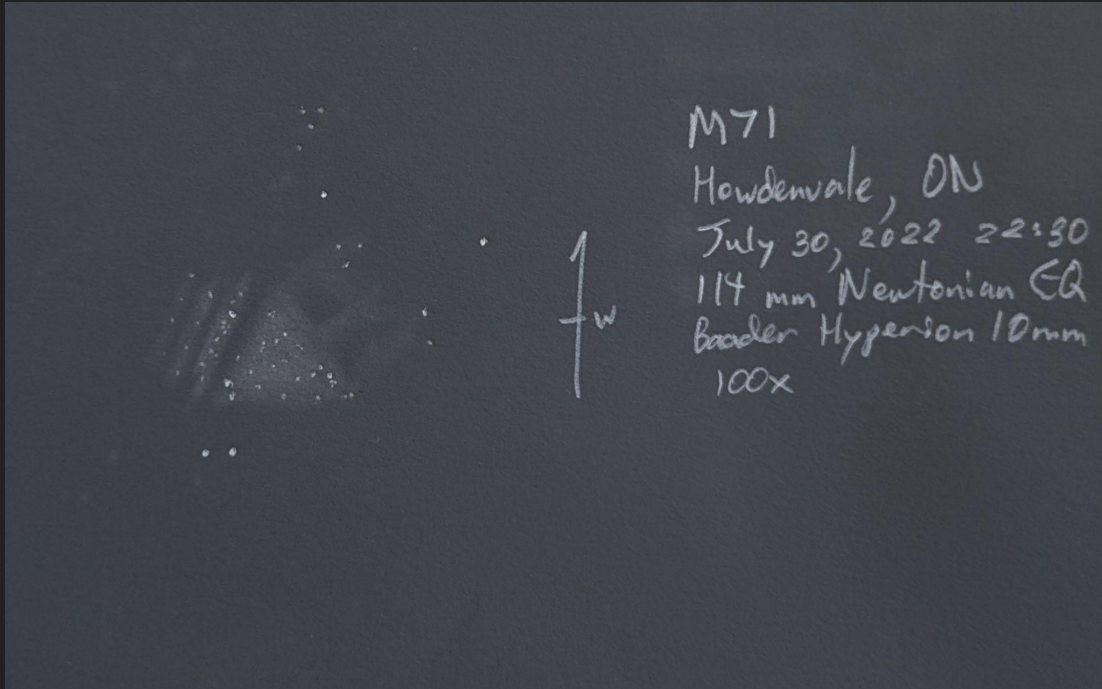
Difficulty: Easy-Moderate



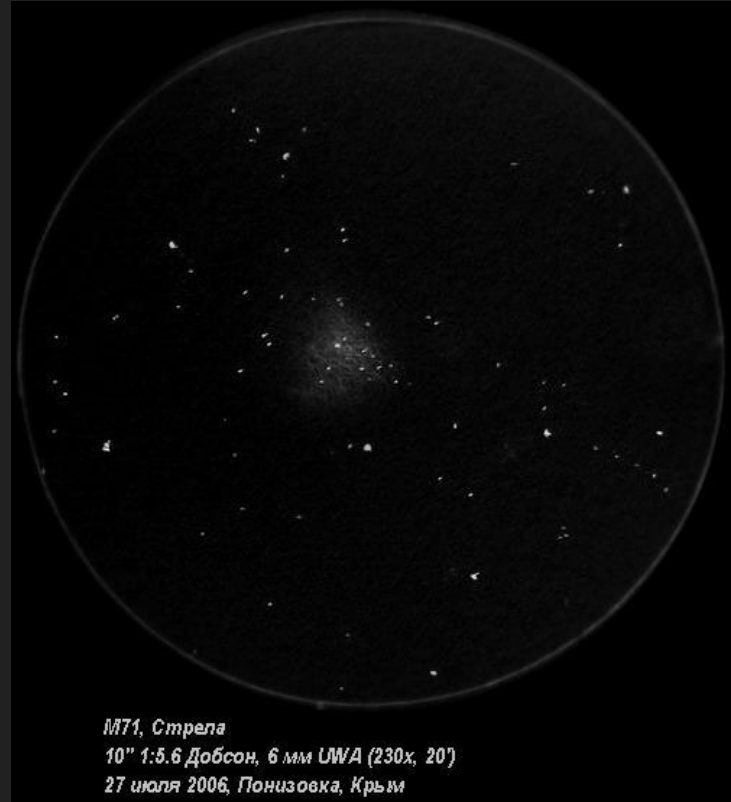
M71 is an interesting globular cluster in that it is very loose - for a long time, it was argued whether or not it was a dense open cluster or in fact a globular cluster. In a low-power field of view, it is at the centre of an area outlined by 4 distinct Y-shaped asterisms facing in different directions. There is an arrow-shaped concentration in the southwest quadrant. Dark lanes can be seen running southeast to northwest.

# 10 - M71 - Angelfish Cluster

By: Michael Wright



By: Ernest Shekolyan





# CI Collinder 408

Type: custom object  
RA/Dec (J2000.0): 19h53m17.05s/+18°20'42.0"  
RA/Dec (on date): 19h54m16.63s/+18°24'09.3"  
HA/Dec: 20h05m31.11s/+18°25'05.0" (apparent)  
Az./Alt.: +97°53'14.4"/+35°08'26.6" (apparent)  
Gal. long./lat.: +56°18'41.8"/-49°41'08.5"  
Supergal. long./lat.: +309°15'13.6"/+75°49'44.7"  
Ecl. long./lat. (J2000.0): +305°04'12.9"/+38°23'56.7"  
Ecl. long./lat. (on date): +305°22'44.7"/+38°23'48.6"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h50m  
Transit: 3h06m  
Set: 10h22m  
Parallactic Angle: -49°04'55.1"  
IAU Constellation: Sge  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



A half a degree south-southwest of M71 lies the challenging, poor cluster Harvard 20.



# 11 - Harvard 20

Type: open cluster

Magnitude: 7.7

Distance: 5707ly

Diameter: 9'

Difficulty - Difficult



Just  $1/2^\circ$  to the south-southwest of M71 lies the poor, neglected open cluster Harvard 20. There are about 20 stars magnitude 11 and fainter, highlighted on the western end by a pair of 9th magnitude stars. It is a bit of a challenge to discern it from the background starfield, perhaps better seen in moderate to large scopes.

# Dumbbell Nebula (Diablo Nebula - Apple Core Nebula) M 27 - NGC 6853 - PK 060-03.1 - PN G060.8-03.6

Type: planetary nebula  
Magnitude: 7.40 (reddced to 7.62 by 1.67 Airmasses)  
Color Index (B-V): 0.20  
Surface brightness: 11.27 mag/arc-min<sup>2</sup> (after extinction: 11.48 mag/arc-min<sup>2</sup>)  
Contrast index: 0.73  
RA/Dec (J2000.0): 19h59m37.66s/+22°43'12.1"  
RA/Dec (on date): 20h00m35.12s/+22°46'50.3"  
HA/Dec: 19h59m12.65s/+22°47'39.5" (apparent)  
Az./Alt.: +92°33'32.4"/+36°47'46.4" (apparent)  
Gal. long./lat.: +60°50'15.9"/-3°42'04.0"  
Supergal. long./lat.: +323°39'26.5"/+73°13'46.8"  
Ecl. long./lat. (J2000.0): +308°24'50.6"/+42°15'11.9"  
Ecl. long./lat. (on date): +308°43'21.2"/+42°15'04.3"  
Ecliptic obliquity (on date): +23°26'16.3"  
Mean Sidereal Time: 15h59m44.0s  
Apparent Sidereal Time: 15h59m43.2s  
Rise: 19h35m  
Transit: 3h12m  
Set: 10h49m  
Parallactic Angle: -51°39'28.5"  
IAU Constellation: Vul  
Size: +0°08'00.00" x +0°05'36.00"  
Orientation angle: 95°  
Distance: 0.264±0.050 kpc (861.2±163.1 ly)  
Redshift: -0.00014±0.000017  
Parallax: 9.000±10.000 mas  
Solar Az./Alt.: +329°34'29"/-16°49'60"  
Lunar Az./Alt.: +41°21'17"/-30°15'42"



Navigate north-northeast to Gamma Sagittae. Our next target, M27, is a 3.3 degree star hop northwards.

# 12 - M27 - The Dumbbell Nebula

Type: planetary nebula

Magnitude: 7.5

Distance: 1360ly

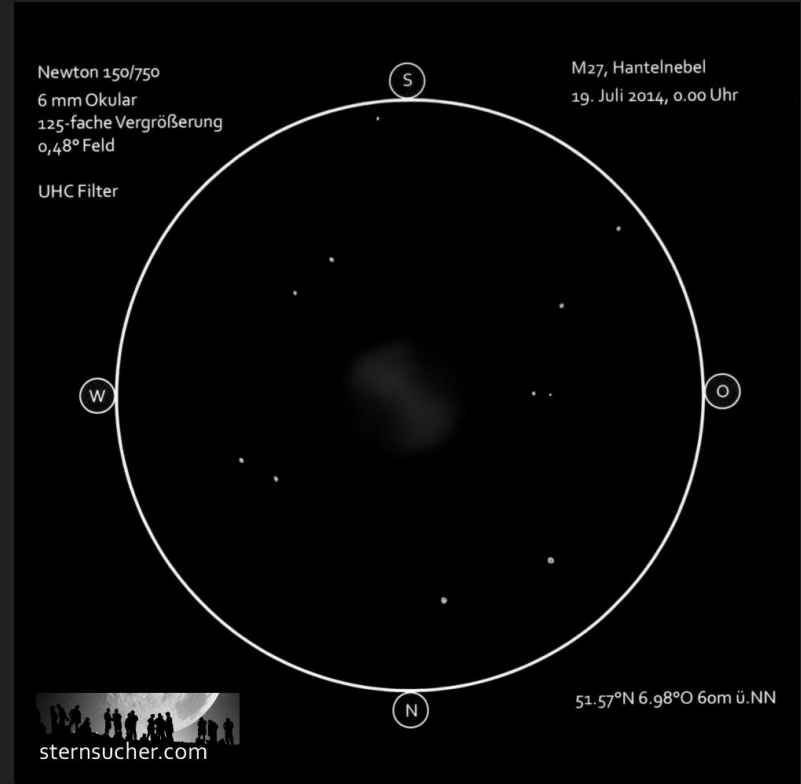
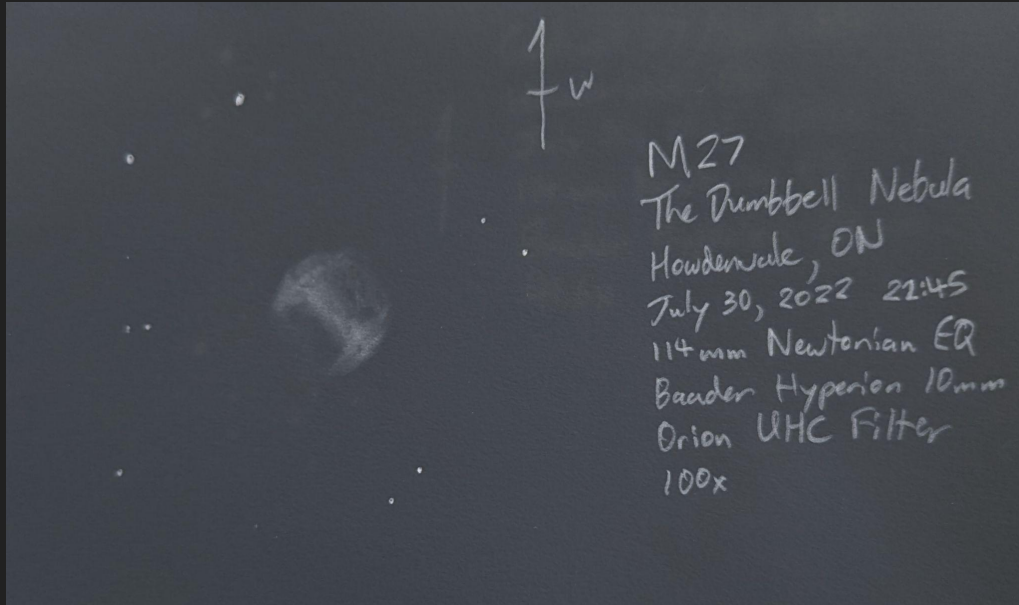
Size: Brightest Portion 8' by 5'

Difficulty - Easy



Due north of Gamma Sagittae, this planetary nebula is readily visible in 7x50 binoculars even under moderately light polluted skies! In small telescopes, looks vaguely rectangular to apple-core shaped with a hint of mottling, and a grey-green colour. In larger telescopes, look for the faint lobes on either side of the much brighter bar.

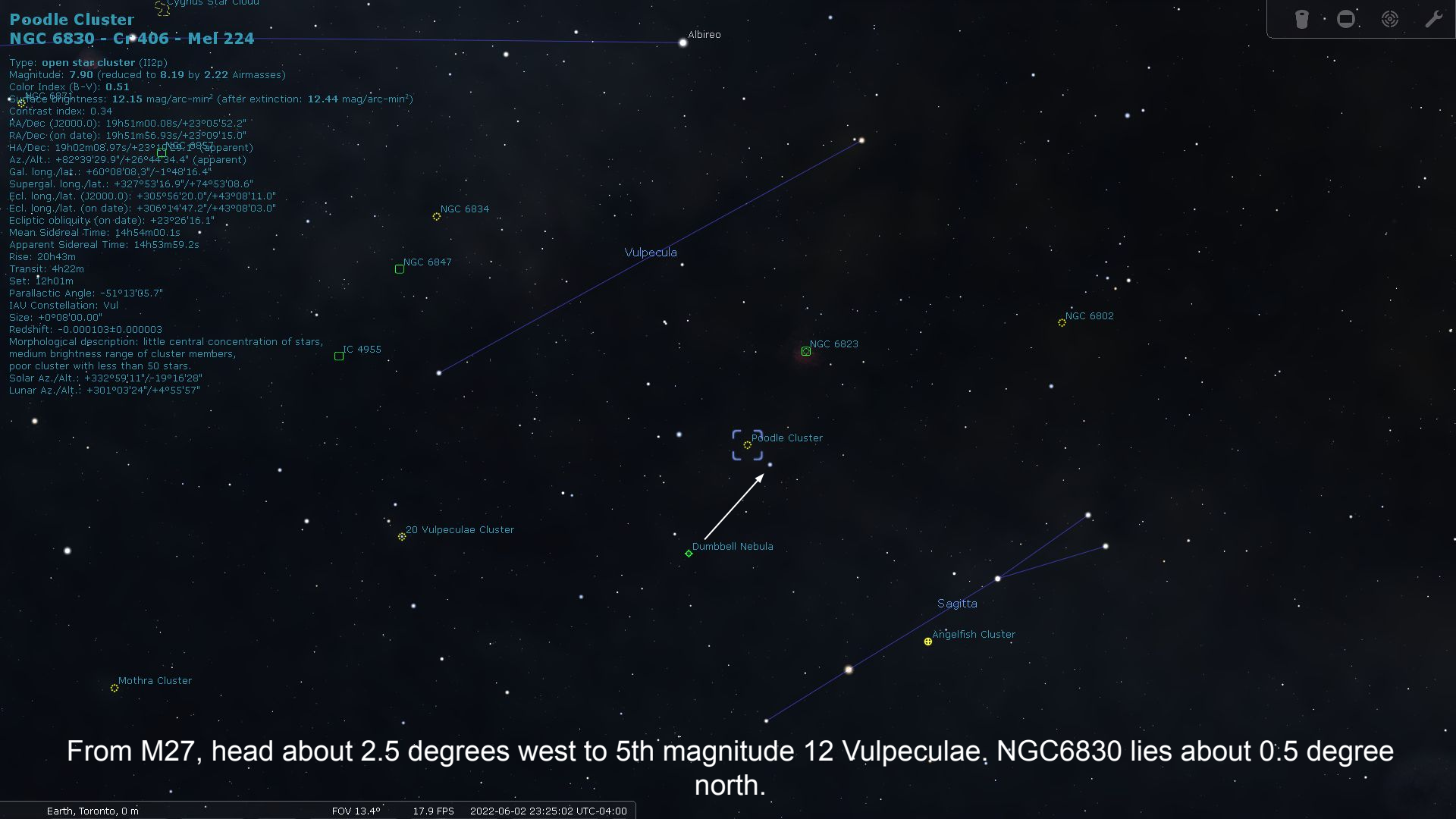
# 12 - M27 - The Dumbbell Nebula





# Poodle Cluster NGC 6830 - Cr 406 - Mel 224

Type: **open star cluster** (II2p)  
Magnitude: **7.90** (reduced to **8.19** by **2.22** Airmasses)  
Color Index (B-V): **0.51**  
NGC Brightness: **12.15** mag/arc-min<sup>2</sup> (after extinction: **12.44** mag/arc-min<sup>2</sup>)  
Contrast index: 0.34  
RA/Dec (J2000.0): 19h51m00.08s/+23°05'52.2"  
RA/Dec (on date): 19h51m56.93s/+23°09'15.0"  
HA/Dec: 19h02m08.97s/+23°11'09.93" (apparent)  
Az./Alt.: +82°39'29.9"/+26°44'34.4" (apparent)  
Gal. long./lat.: +60°08'08.3"/-1°48'16.4"  
Supergal. long./lat.: +327°53'16.9"/+74°53'08.6"  
Ecl. long./lat. (J2000.0): +305°56'20.0"/+43°08'11.0"  
Ecl. long./lat. (on date): +306°14'47.2"/+43°08'03.0"  
Ecliptic obliquity (on date): +23°26'16.1"  
Mean Sidereal Time: 14h54m00.1s  
Apparent Sidereal Time: 14h53m59.2s  
Rise: 20h43m  
Transit: 4h22m  
Set: 12h01m  
Parallactic Angle: -51°13'05.7"  
IAU Constellation: Vul  
Size: +0°08'00.00"  
Redshift: -0.000103±0.000003  
Morphological description: little central concentration of stars,  
medium brightness range of cluster members,  
poor cluster with less than 50 stars.  
Solar Az./Alt.: +332°59'11"/-19°16'28"  
Lunar Az./Alt.: +301°03'24"/+4°55'57"



From M27, head about 2.5 degrees west to 5th magnitude 12 Vulpeculae. NGC6830 lies about 0.5 degree north.

# 13 - NGC6830 - Poodle Cluster

Type: open cluster

Magnitude: 7.9

Distance: 4800ly

Size: 8'

Difficulty - Moderate



This 20-star cluster has an interesting cross-in-a-cross shape, or some people see a dog. It's brightest stars are 9th magnitude, a score brighter than 13th magnitude.

# NGC 6823 - SH 2-86 - LBN 135 - Cr 405

Type: **cluster associated with nebulosity** (1, 2, 2)  
Magnitude: **7.10** (reduced to **7.37** by **2.11** Airmasses)  
Color Index (B-V): **0.61**  
Surface brightness: **14.54** mag/arc-min<sup>2</sup> (after extinction: **14.81** mag/arc-min<sup>2</sup>)  
Contact Index: -0.60  
NGC 6823  
RA/Dec (J2000.0): 19h43m10.19s/+23°17'52.3"  
RA/Dec (on date): 19h44m06.74s/+23°21'01.6"  
HA/Dec: 19h09m58.78s/+23°22'10.7" (apparent)  
Az./Alt.: +83°45'10.5"/+28°16'08.6" (apparent)  
Gal. long./lat.: +59°24'08.2"/0°09'56.4"  
Supergal. long./lat.: +332°07'38.6"/+76°21'36.3"  
Ecl. long./lat. (J2000.0): +303°36'16.0"/+43°46'27.8"  
Ecl. long./lat. (on date): +303°54'43.3"/+43°46'19.5"  
Ecliptic obliquity (on date): +23°26'16.1"  
Mean Sidereal Time: 14h54m00.1s  
Apparent Sidereal Time: 14h53m59.2s  
Rise: 20h34m  
Transit: 4h14m  
Set: 11h54m  
Parallactic Angle: -51°29'10.2"  
IAU Constellation: Vul  
Size: +0°40'00.00" x +0°30'00.00"  
Redshift: 0.000057  
Morphological description: circular form,  
conventional structure,  
moderate brightness.  
Solar Az./Alt.: +332°59'11"/-19°16'28"  
Lunar Az./Alt.: +301°03'24"/+4°55'57"



Heading another 2.5 degrees west, we arrive at open cluster NGC6823, enrobed in the nebula NGC6820.

# 14 - NGC6820 & NGC6823

Type: open cluster + emission nebula

Magnitude: 7.1 (cluster)

Distance: 6000ly

Size: 40'

Difficulty - Moderate (cluster) / Difficult (nebulosity)

This cute little cluster (NGC6823) is wrapped in faint nebulosity (NGC6820) that requires large aperture, dark skies and UHC or OIII filters. The cluster is round and petite and only about 2 million years old. With lots of dark lanes and mottling, this is also a nice target for astrophotographers.





# 20 Vulpeculae Cluster

## C 37 - NGC 6885 - Cr 417

Type: **open star cluster** (III2p)  
Magnitude: **8.10** (reduced to **8.40** by **2.35** Airmasses)  
Color Index (B-V): **0.61**  
NGC Brightness: **14.34** mag/arc-min<sup>2</sup> (after extinction: **14.65** mag/arc-min<sup>2</sup>)  
Contrast index: -0.54  
RA/Dec (J2000.0): 20h12m01.92s/+26°28'31.7"  
RA/Dec (on date): 20h12m57.56s/+26°32'29.9"  
HA/Dec: 18h41m09.08s/+26°34'48.99s (apparent)  
Az./Alt.: +76°24'48.4"/+25°07'23.9" (apparent)  
Gal. long./lat.: +65°31'44.4"/-4°04'43.2"  
Supergal. long./lat.: +330°37'08.7"/+69°05'56.9"  
Ecl. long./lat. (J2000.0): +313°38'18.2"/+45°02'28.9"  
Ecl. long./lat. (on date): +313°56'43.9"/+45°02'22.0"  
Ecliptic obliquity (on date): +23°26'16.1"  
Mean Sidereal Time: 14h54m00.1s  
Apparent Sidereal Time: 14h53m59.2s  
Rise: 20h46m  
Transit: 4h43m  
Set: 12h40m  
Parallactic Angle: -51°44'30.6"  
IAU Constellation: Vul  
Size: +0°20'00.00"  
Distance: 0.600 kpc (1957.2 ly)  
Redshift: -0.000005±0.000003  
Morphological description: no noticeable concentration of stars, medium brightness range of cluster members, poor cluster with less than 50 stars.  
Solar Az./Alt.: +332°59'11.1"/-19°16'28"  
Lunar Az./Alt.: +301°03'24.7"/+4°55'57"



Around 3 degrees east northeast we come to mag 4.5 13 Vulpeculae. Continuing on 3 degrees in this direction we come to a pair mag 5.5 stars at 16 Vulpeculae. Another 3 degrees further we arrive at NGC6885.

# 15 - Caldwell 37 / NGC6885

Type: Open Cluster(s)

Magnitude: 8.1

Distance: 1360ly

Size: Brightest Portion 8' by 5'

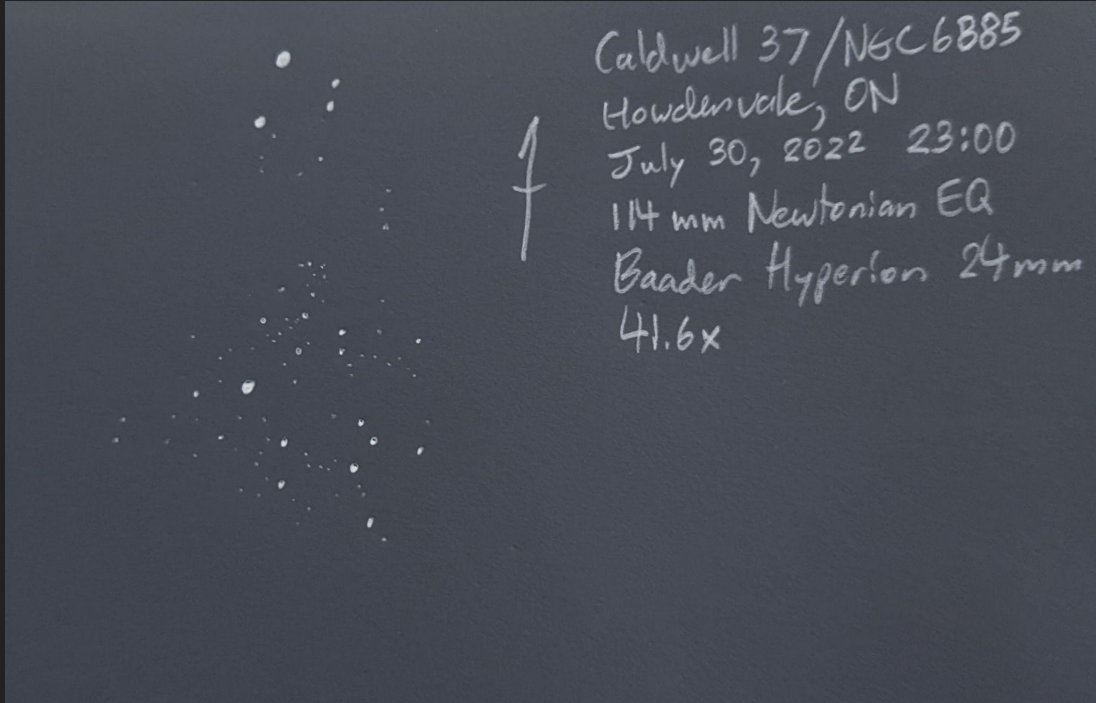
Difficulty - Easy-Moderate



This cluster forms a glistening ring of stars with 20 Vulpeculae as the sapphire gem on the eastern side. Just to the north, 19 and 18 Vulpeculae form a pretty grouping with some other stars. Dreyer catalogued another cluster in this location, NGC6882, but there does not appear to be one - was it an erroneous re-discovery of NGC6885 by Herschel?

# 15 - Caldwell 37 / NGC6885

By: Michael Wright







# 16 - NGC6940 - Mothra Cluster

Type: open cluster

Magnitude: 6.3

Distance: 2600ly

Size: 25'

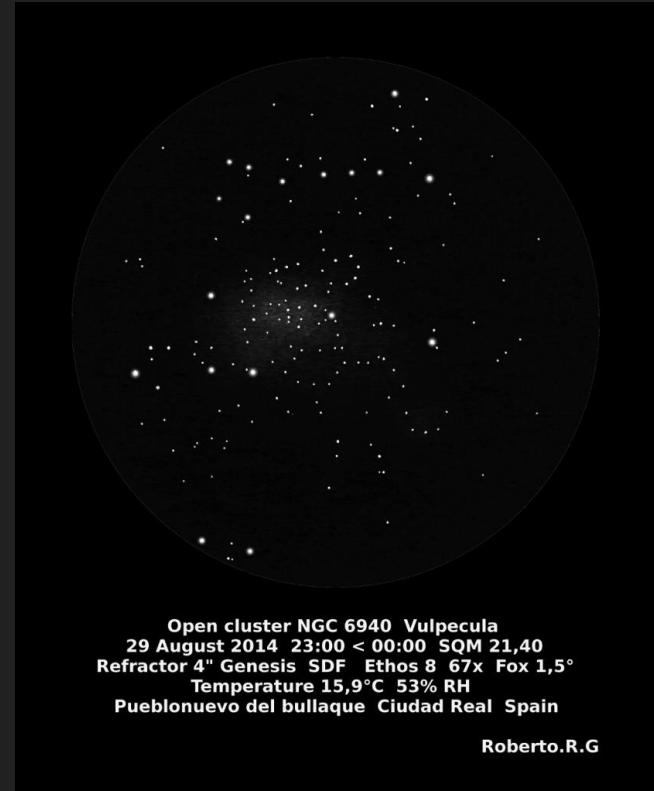
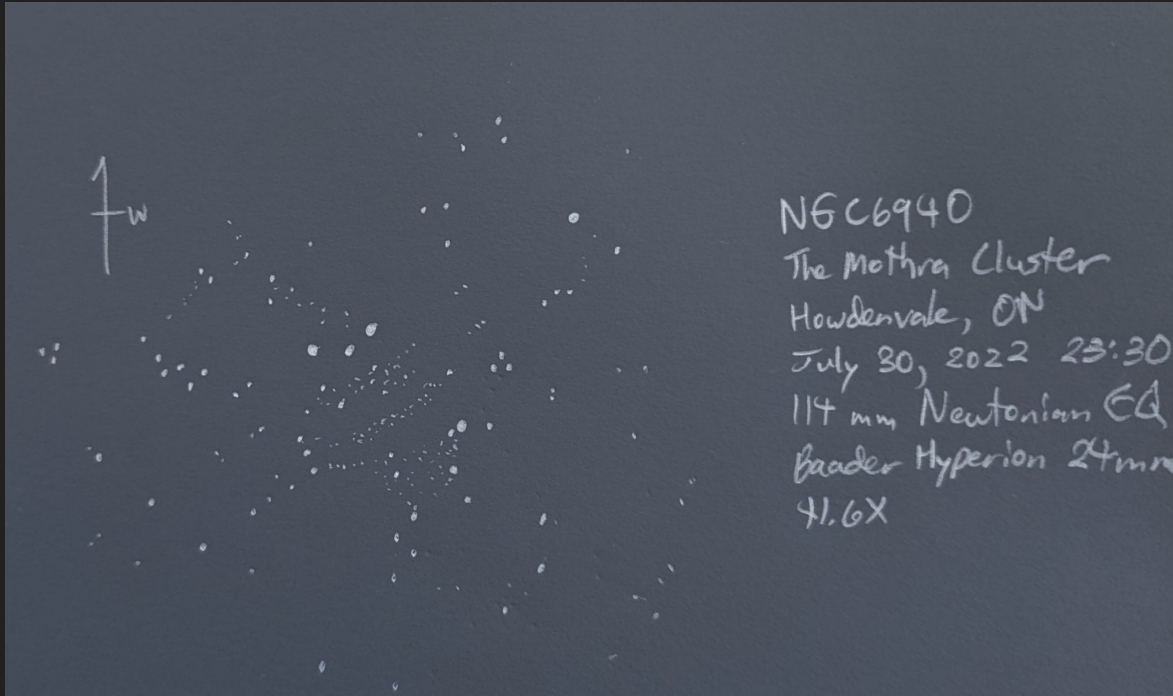
Difficulty - Easy



Largely missed by many observers, this hidden treasure of at least 170 stars is easily seen in 7x50 binoculars as an elliptical swarm. The brightest members shine at 11th magnitude. There are some brighter field stars superimposed on the cluster. In a small telescope, it is quite stunning under a dark sky. It is best viewed at low power, where it has a rich, mottled glow. The brightest star here is the semi-regular variable FG Vulpeculae, with a warm orange hue that contrasts with its aquamarine companion. O'Meara thinks the cluster looks like Mothra from the Godzilla movies of the 1960s.

# 16 - NGC6940 - Mothra Cluster

By: Michael Wright



# References:

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[www.wikipedia.org](http://www.wikipedia.org)